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Age of Public Infrastructure: A Provincial Perspective

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Age of Public Infrastructure: A Provincial Perspective

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Summary

Like many other developed countries, Canada invests billions of dollars a year to repair, upgrade and expand its public infrastructure. Whether it involves paving roads, renovating bridges or upgrading sewer and water systems, all levels of governments and the private sector work together to ensure that Canada's public infrastructure is safe and meets the needs of a growing population and economy.

This study sheds light on the age[1] status and trends of five key public infrastructures from a provincial perspective, and compares average ages with the useful life of each infrastructure.

Five public assets are covered in this study: highways and roads, bridges and overpasses, water supply systems, wastewater treatment facilities and sanitary and storm sewers. Gross stock in these assets amounted to $286.2 billion in 2007, 5.3% more than in 2001. Combined, they accounted for more than 80% of all engineering infrastructure owned by federal, provincial and municipal governments in 2007.

This study found that since 2001, the average age of public infrastructure in Canada has been falling almost steadily. In 2007, it reached 16.3 years, down from its peak of 17.5 seven years earlier. This rejuvenating trend was fuelled by large investments in highways and roads in Quebec and Ontario. A reduction in the average age is indicative of a general trend toward younger stock of investments. It doesn't imply necessarily that each physical asset is younger or in better conditions or that a greater proportion of assets meets specific quality standards.

In 2007, the average age of the five public infrastructure assets was higher than the national average in all provinces east of Ontario, except Prince Edward Island where infrastructure on average was a relatively young 15.5 years, thanks to the Confederation Bridge. Infrastructure was also older than the national average in Manitoba and Saskatchewan while Alberta and Ontario showed the reverse. The average age in British Columbia was equal to the national average.

Highways and roads, the largest component of the five public assets, were worth $170.1 billion in 2007, representing 59% of the total. The average age of roads in Canada increased steadily since the beginning of the 1970s to a peak of 16.9 years in 1994; by 2007, it had shortened to 14.9 years. Since 2001, the average age of roads has diminished in all provinces, except Prince Edward Island and Newfoundland and Labrador. Quebec alone accounted for more than half the drop during the six-year period.

Bridges and overpasses accounted for 8% of total public assets in 2007. Unlike roads however, investments in bridges have been under the level required to hold their age constant. Hence, the average age of this asset rose by 3.2 years from 21.3 in 1985 to 24.5 in 2007. Bridges have a mean service life of 43.3 years. This means that Canada's bridges have passed 57% of their useful life, compared with 53% for roads. The ratio for bridges was the second highest of the five assets, after wastewater treatment infrastructures. It hit 66% in Nova Scotia and 72% in Quebec.

Water supply systems, including pumping and filtration stations, saw their average age diminish from 16.9 years in 2001 to a record low of 14.8 years in 2007. This rejuvenating trend was pushed by large investments, especially in British Columbia, Ontario and Alberta. These provinces recorded also strong growth in their urban population during the period.

Unlike other public infrastructure assets, Canada's stock of wastewater treatment plants has declined by 1.1% a year on average from 2001 to 2007. The decline spread across most provinces, except Nova Scotia and Alberta. As a result, the average age edged up from 17.4 to 17.8 years. Wastewater treatment assets have passed 63% of their useful life in 2007, the highest ratio among the five public infrastructure assets.

The stock of sanitary and storm sewers has increased 1.0% a year on average since 2001. However, this growth rate was not large enough to reverse the ageing trend of this asset, the average age of which reached a record high of 17.9 years in 2007. The average age of sewers grew slightly in all provinces, except Ontario, Manitoba, Saskatchewan and Alberta.

1. For readability, when average ages of gross capital stock invested in public infrastructures are discussed in this paper, technical terms are omitted and references are made to average ages of public infrastructures.

Key concepts

Public infrastructure

For the purpose of this paper, we define public infrastructure as consisting of the following five assets: roads including highways[2], bridges including overpasses, water supply systems[3], wastewater treatment facilities[4] and sewer systems[5]. Investments in these infrastructure assets are financed for the most part by federal, provincial, and local governments but may also include private sources. Investment represents spending on assets for repairing, upgrading and expanding existing stocks. Such assets generally have a service life of more than one year and include new fixed capital formation and investment in replacement assets. The value of an asset is discarded from the value of the gross stock at the end of its service life.

Data in this paper are presented for Canada and for each province separately. Unless otherwise indicated, data for the Yukon Territory, the Northwest Territories and the Nunavut are included in the Canada total but are not presented separately because of confidentiality.

Useful life and mortality function[6]

The useful life of an asset is its estimated productive life, that is, the length of its useful life at the time of its acquisition. For example, an asphalt roadway—whether it is a road or highway—has a mean service life of about 28 years. The service life is an average based on data from the Capital and Repair Expenditure Survey and has been confirmed by empirical studies that link the value of gross stock with asset useful life and other engineering information. The survey also provides data on the age-price profiles of discarded assets.

The mortality function determines the retirement (decommissioning) of assets from capital stock when the assets reach the end of their useful life. The function used for asset retirement is represented by a normal distribution truncated at the tails.[7] The distribution reflects service life variation due to asset quality and maintenance.

Average age of capital stock

For analytical purposes, economists use a complex formula to estimate the age of public assets such as roads and bridges. The key factor is the amount of investment in public infrastructure. Without sufficient investment, the stock of infrastructure declines and its age increases.

More precisely, the variables used to compute the average age of capital stock are the investment, the survival function, the year in which the investment was made, and year-end gross capital stock. In practice, there can be several different types of distributions for a given average age. For example, there can be structures whose ages are clustered around the average age, or a combination of young structures with much older structures. Hence, short-term investments required to extend the useful life of different sets of assets with similar average ages can vary greatly depending on the age distribution of the various asset components.

Average age as a percent of useful life

The ratio of the average age per year of useful life provides a relative measure of the amount of useful life expended for a given set of asset. This ratio is useful for comparing the oldness of assets with different lengths of useful life.

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2. Roads include streets, logging roads, road signs, guardrail and lighting.
3. Water supply systems include water pumping stations, filtration plants and water distribution systems.
4. Wastewater treatment facilities include sewage treatment and disposal plants including pumping stations.
5. Sewer systems include sanitary and storm sewers, trunk and collection lines and open storm ditches.
6. For more information on how Statistics Canada computes the useful life, mortality function and asset age, please see *Investment Flows and Capital Stocks–Methodology*, 2001, Statistics Canada, http://www.statcan.ca/english/sdds/document/2820_D1_T9_V1_B.pdf (accessed December 7, 2007).
7. See André Patry, *Economic Depreciation and Retirements of Canadian Assets: A Comprehensive Empirical Study*, 2007, Statistics Canada Catalogue no. 15-549-XIE2007001, http://www.statcan.ca/bsolc/english/bsolc?catno=15-549-X (accessed January 21, 2008).

Canada: Public infrastructure on a rejuvenating trend for seven years

The average age of Canada's public infrastructure—its highways and roads, bridges and overpasses, water supply systems, wastewater treatment facilities and sanitary and storm sewers—has been falling as a whole for the past seven years. In 2007, it reached 16.3 years, down from its peak of 17.5 in 2000.

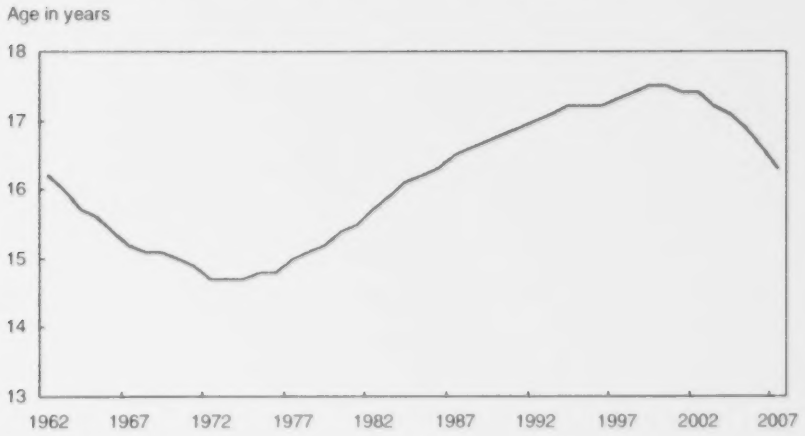
This rejuvenating trend was fuelled largely by higher investments in the network of highways and roads in Quebec and Ontario in recent years.

A reduction in the average age is indicative of a general trend toward younger stock of investments. It doesn't imply necessarily that each physical asset is younger or in better conditions or that a greater proportion of assets meets specific quality standards.

The amount of investment—and the corresponding average age—that would be required to ensure that all assets comply with a given quality level can only be determined based on appropriate engineering methods. Quality levels depend on several factors, including public health and safety regulations and competing demands on government available resources.

In Canada, the majority of investments in public infrastructure were done during the 1950s, 1960s and early 1970s. In the beginning of the 1970s, the average age of public infrastructure hit an all-time low of 14.7 years. This major expansionary period was followed by more modest investments during the 1980s and 1990s when needs for major repairs or additions were less pressing. By the turn of the millennium, the average age of public infrastructure had then risen to an all-time high of 17.5 years.[8]

Chart 1 Public infrastructure on a rejuvenating trend since 2001



Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.

8. For more information about national trends including the distribution of public assets by level of government, see Valérie Gaudreault and Patrick Lemire, "The Age of Public Infrastructure in Canada," *Analysis in Brief*, 2006, Statistics Canada Catalogue no. 11-621-MWIE2006035, http://www.statcan.ca/english/research/11-621-MIE/11-621-MIE2006035.htm (accessed December 7, 2007).

Research has demonstrated that countries with modern, safe and efficient infrastructure are more productive and more competitive on international markets.[9] As a result, citizens enjoy higher quality of life stemming from economic growth. However, the development and maintenance of public infrastructure require heavy and steady investments of public funds.

In 2000, investments in public infrastructure experienced resurgence, halting the ageing trend. This stabilized the average age of the total stock at 17.5 years in 2000. Major sustained investments thereafter prompted a drop in the average age to 16.3 years in 2007, which was equivalent to the average two decades earlier. From 2001 to 2007, total public infrastructure stock increased 5.3% in 2002 constant dollars. During this same period, total population grew 6.3% and real gross domestic product rose an average of 2.3% per year.

Majority of investments went to new construction

Over the last 15 years, the lion's share of investments was for new construction while renovation and restoration work absorbed a small part of the pie. In the case of highways and roads, new construction consistently took up about 80% of investment budgets leaving 20% for renovating the road network. The rates for bridges and overpasses were similar to those of highways and roads during the 1990s, but renovation has been taking up an increased share in recent years, up to 30%.

Renovations are required not only for visible assets such as roads and bridges but also for more hidden ones like sewer and wastewater systems. In 2007, gross stock of investments in sanitary and storm sewers as well as wastewater treatment amounted to $59.9 billion or 21% of the five assets included in this study. In the 1990s, more than 90% of these investments were for new infrastructure while an increasing share was allocated to renovation and restoration in recent years.

Public infrastructure assets older in six provinces

Public infrastructure across cities and provinces has many characteristics in common, such as divided highways, paved roads and water supply systems. But the infrastructure differs somewhat on a regional basis, for example, in design, construction materials and usage, depending on the local geography, climate conditions, population density and economic activity.[10]

In 2007, the average age of public infrastructure exceeded the national average of 16.3 years in six provinces: the Atlantic Provinces with the exception of Prince Edward Island, Quebec, Manitoba and Saskatchewan. In the case of Prince Edward Island, the average age was a young 15.5 years, thanks to the construction of the Confederation Bridge.

Overall, the youngest average ages of the five selected public infrastructure assets were found in Ontario, Prince Edward Island and Alberta. The average age in British Columbia was equal to the national average.

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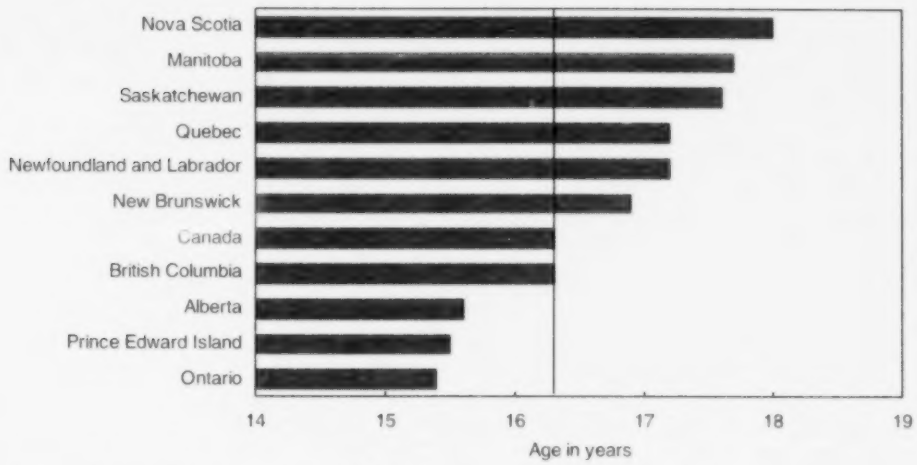
9. See Tarek Harchaoui, Faouzi Tarkhani and Paul Warren. "Public Infrastructure in Canada, 1961-2002," *Canadian Public Policy*, vol. 30, no. 3, September 2004, pp. 313-318.

10. Differences in average age between provinces can also be attributable to the varying mix of assets in each province. For example, a province with relatively more bridges will tend to have a higher average age because bridges last longer than other assets. When adjusting for this factor, no significant difference in the ranking showed in Chart 2 is found, except for Manitoba which would rank fourth oldest after Nova Scotia, Saskatchewan and Quebec. Alberta and Prince Edward Island would also flip their relative position.

Chart 2 Public infrastructure assets older in six provinces



Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.

Highways and roads on a renewal journey

Highways and roads are the largest component of the five public assets in Canada. Their value amounted to $170.1 billion in 2007, which represented 59% of all five public assets considered in this study.

The road network was expanded substantially during the 1960s and 1970s to cope with increasing demand arising from strong population growth, urbanization, urban sprawl and increased car usage. Consequently, the average age of the stock was then considerably younger, and hit its lowest level ever in the early 1970s at close to 13.0 years. Its age then rose steadily to a peak of 16.9 years in 1994; in 2007, it had dropped back to 14.9 years.

Since 2001, the average age of roads has dropped in all provinces, except Prince Edward Island and Newfoundland and Labrador. More than half of this recent reduction in age was attributable to Quebec, where the average age of roads dropped by 2.8 years over a span of seven years, from 18.0 years in 2001 to 15.2 in 2007. There were also large drops in Nova Scotia (-2.2 years), Saskatchewan (-1.8 years) and Ontario (-1.6 years) for the same period.

A road has a mean service life estimated at 28.2 years in Canada.[11] This figure is survey based and has been confirmed by empirical studies that link the value of gross stock with asset service life and other engineering information. Expressed as a percentage of useful life, the average age of roads in Canada stood at 53% in 2007. In other words, Canada's roads had passed just over half of their useful life in 2007. In 1973, this ratio was as low as 47%. During the 1990s, it rose to a peak of 60%, and has dropped since then. In 2007, this ratio ranged from a low of 49% in Ontario and Prince Edward Island to 61% in Manitoba.

More and more, the network of highways and roads is a crucial element of our growing economy and productivity. With elimination of trade barriers, rising online purchases and home delivery and

11 See text box entitled "Key concepts" at the beginning of the study.

"just-in-time" inventory strategies, goods are transported increasingly by road, and for longer distances, adding to local and inter-city traffic.

Each year, budgets are allocated to fix and expand the transportation network which is continually under stress. From 2001 to 2007, the value of the highways and road gross stock in Canada increased by 0.5% a year on average, compared with 0.9% for all five assets combined. However, this was much slower than the 1.8% increase for schools, colleges and universities, and 2.1% for hospitals and nursing homes.

Nation's bridges and overpasses getting older

In 2007, the gross stock of bridges and overpasses amounted to $23.9 billion, or 8% of the five assets combined. Unlike roads however, investments on bridges have been under the level required to hold their age constant. Hence, ageing has been the rule since the mid-1980s. The average age of bridges went from 21.3 years in 1985 to 24.5 years in 2007, an increase of 3.2 years.

Between 2001 and 2007, the gross stock in these assets grew only 0.4% a year on average, causing the average age of bridges to increase by 0.8 years during this period. The ageing process has been fastest in Prince Edward Island (+5.1 years) and Nova Scotia (+4.4 years).

While bridges last longer than roads, they remain an important piece of the road network. They require regular inspection and investments to ensure that they are safe to use and in good condition.[12] Bridges have a mean service life estimated at 43.3 years. In 2007, bridges passed 57% of their useful life, compared with 53% for roads. In this same year, the ratio for bridges was the second highest of the five assets covered in this study, after wastewater treatment infrastructures.

Provincially, the ratio for bridges ranged from an exceptional low of 36% in Prince Edward Island (thanks to the Confederation Bridge) to peaks of 66% in Nova Scotia and 72% in Quebec.

Water supply systems younger than ever

Not as visible as roads and bridges, water supply systems, which include water pumping stations, water filtration facilities and water distribution systems, are key assets of public infrastructure. They are vital to our day-to-day well-being.[13] In 2007, the value of the gross stock invested in these infrastructures amounted to $32.3 billion, or 11% of the five public assets.

Most water supply systems are owned and maintained by local governments. From 2001 to 2007, the value of the gross stock for this infrastructure increased by 5.1% a year on average, 10 times faster than the rate for roads and bridges. The growth was above average in British Columbia, Ontario and Alberta. These provinces also recorded strong growth in their urban population during the period.

As a result, the average age of the stock was reduced from 16.9 years in 2001 to an all-time low of 14.8 years in 2007. Nearly 40% of this reduction in age was attributable to Ontario, where the average age dropped by 4.1 years to 13.1 years. The only other province where water supply

12. See "*Commission of Inquiry into the Collapse of a Portion of the De la Concorde Overpass*", Gouvernement du Québec, 2007, http://www.cevc.gouv.qc.ca/Rapport/index.html (accessed December 20, 2007).

13. See "*Report of the Walkerton Inquiry*", Queen's Printer for Ontario, 2002, http://www.attorneygeneral.jus.gov.on.ca/english/about/pubs/walkerton/ (accessed December 20, 2007).

systems were younger than in Ontario was British Columbia at 11.4 years in 2007. The average age of water supply systems rose in only two provinces, Quebec and Newfoundland and Labrador. By 2007, Canada's water supply systems had reached 40% of their useful live (which is 36.8 years on average).

Wastewater treatment infrastructure: Oldest relative to its useful life

Adequate treatment of wastewater is important not only for sanitary reasons but also for environmental considerations. Recent findings from Environment Canada indicate that one of the largest point source of phosphorus to marine and fresh waters in Canada is municipal sewage.[14] Inadequate wastewater treatment, especially in rural and remote areas, is one of the factors contributing to high phosphate concentration which has been linked to the growth of blue-green algae. Overflows from combined sanitary and storm sewers in many cities may also contribute to phosphate loadings in lakes and rivers.

The average age of wastewater treatment facilities increased slightly from 17.4 years in 2001 to 17.8 in 2007. Most of the recent ageing in this asset has been led by Quebec, where the average age went from 16.9 in 2001 to 19.1 years in 2007, second oldest in the country after Prince Edward Island. British Columbia also contributed to the ageing process at the national level as the average age of its wastewater treatment facilities rose from 14.6 in 2001 to 17.2 years in 2007. The average dropped in all other provinces.

The average age of Canada's wastewater treatment facilities has been increasing steadily since the late 1970s. The average useful life for this asset is estimated at 28.2 years. In 2007, these facilities passed 63% of their useful life nationally, the highest ratio among the five public infrastructure assets. Provincial figures were all above the 60% mark with Prince Edward Island ranking at the top.

Unlike other infrastructure assets, the value of Canada's wastewater treatment stock has diminished in recent years, declining 1.1% a year on average from 2001 to 2007, when it was worth $24.0 billion. The decline spread across all provinces except Nova Scotia and Alberta.

The declines in wastewater treatment stocks were due to large investments made in the early 1980s which became older than their average useful life and were therefore subtracted from gross stocks. Recent investments were not large enough to compensate for these declines. It should be noted that a drop in the stock doesn't imply a decline in the volume of wastewater treatment. Recent investments might have been sufficient to maintain capacity or capacity utilisation might have increased.

Sanitary and storm sewers on a continuing ageing trend

The responsibility for sanitary and storm sewers rests with municipal governments. However, funding for upgrading or expanding current sewer systems is a matter joint partnership between the various levels of governments and sometimes the private sector.

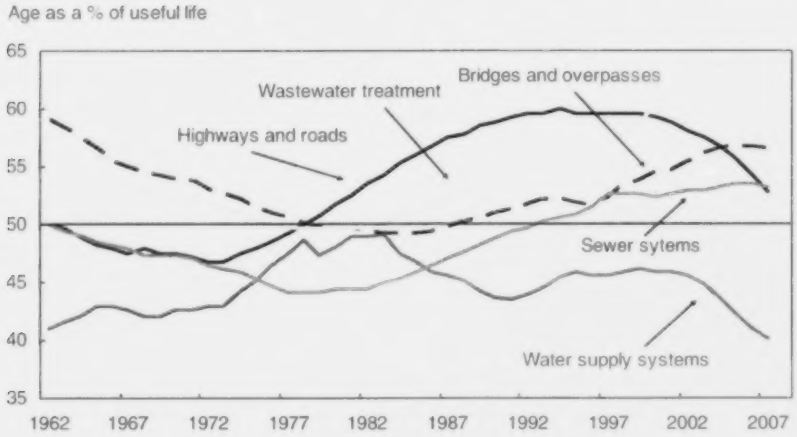
In Canada, the value of the gross stock of sanitary and storm sewers amounted to $36.0 billion, or 13% of the five assets. This was the second largest public asset after highways and roads. This stock has been growing at an average annual rate of 1.0% since 2001. However, despite this growth, the average age continued to climb reaching its all-time high of 18.0 years in 2006. In fact,

14. See "*Canadian Environmental Sustainability Indicators*", Environnement Canada, Health Canada and Statistics Canada, 2007, Statistics Canada Catalogue No. 16-251-XIE, http://www.statcan.ca/bsolc/english/bsolc?catno=16-251-XIE (accessed December 12, 2007)

this asset has been ageing almost steadily since 1977 with the exception of 2007 when the average age dropped marginally to 17.9 years.

The average age grew slightly in all provinces except Ontario, Manitoba, Saskatchewan and Alberta. The overall moderate ageing trend was fuelled mainly by Quebec, where the average rose from 17.3 in 2001 to 18.1 years in 2007, and British Columbia, where it edged up from 16.6 to 16.9 years during the same period. In 2007, these facilities had passed 53% of their useful life (which is 33.6 years on average) nationally; three decades earlier, this proportion stood at 44%.

Chart 3 Useful life expended highest for water treatment infrastructure since 2000



Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.

Newfoundland and Labrador: Average age of public infrastructure lessened for the second consecutive year in 2007

The value of public infrastructure assets in Newfoundland and Labrador amounted to $6.0 billion in 2007. The average age of the combined five public infrastructure assets has dropped slightly in 2006 and 2007 after almost 26 years of continuous increases. The average age went from 13.9 years in 1979 to a peak of 17.4 years in 2004 and 2005. It then lessened for the first time since 1979 to 17.3 in 2006 and 17.2 in 2007.

This recent reduction in age was due to increased investment in roads and bridges in the last few years. Higher investments in wastewater treatment facilities since the late 1990s also contributed to this trend reversal. In contrast, water supply and sewer systems continued to age.

Despite this recent reduction in age, the long ageing trend maintained Newfoundland and Labrador's public infrastructure above the average national age in 2007. This province, along with Quebec, had the fourth oldest public infrastructure in 2007, behind Nova Scotia, Manitoba and Saskatchewan.

Highways and roads: Third oldest network in Canada

Highways and roads, the largest component of public infrastructure assets in the province, accounted for 59% of the total in 2007. The average age of this asset rose steadily from 12.3 years in 1973 to 16.8 years in 2005 as the rate of new investment failed to keep pace with the ageing of previous investments. The trend reversed in the most recent two years with the average age dropping to 16.4 years in 2007.

While there has been a steady ageing of the province's road infrastructure since the mid-1970s, roads and highways remained younger than the national average until the early 2000s.

In 2007, the average age of Newfoundland and Labrador's roads reached 58% of their estimated useful life, compared with 53% for Canadian roads. As a result, the province had, along with Nova Scotia, the third oldest road network, behind Manitoba and Saskatchewan.

Bridges and overpasses: Younger than Canadian average

The average age of provincial bridges and overpasses has also dropped in recent years. It went from 22.2 years in 2004 to 20.9 years in 2007, reflecting increased investments. This follows a long period of ageing since 1979, when the average age was only 17.3 years.

Along with the water supply systems, bridges and overpasses were the second most important asset stock component in Newfoundland and Labrador in 2007, accounting for 12% its public infrastructure stock. As a percentage of the estimated useful life, bridges have generally tended to be younger than the national average. The rate was 48% in 2007, 9 percentage points under the Canadian average. Newfoundland and Labrador had the second youngest bridges among provinces in 2007, behind Prince Edward Island.

Water supply systems: Ageing, but close to national average age

Water supply systems have shown a slight trend towards ageing in the province since 1993, when the average age was at an all time low of 11.7 years. This ageing trend has continued in recent years even though the value of the gross stock kept rising. In 2007, the average age of water supply systems in the province stood at 14.3 years. Water supply systems accounted for 12% of Newfoundland and Labrador's infrastructure.

As a percentage of estimated useful life, this infrastructure was historically older than the national average up until the 1980s. Since then the ratio has been consistently below or close to the national average standing at 39% in 2007.

Wastewater treatment: Discarding older investments reduced average age

The average age of the stock of wastewater treatment facilities peaked at 19.5 years in 1999 in Newfoundland and Labrador. Although investments were much lower in 2007 than at any time since 1999, its average age was reduced to 17.6 years in 2007. This fall is mainly attributable to the discarding of older investments from the gross stock base.

In terms of the percentage of estimated useful life, there has been a general trend toward ageing of wastewater treatment infrastructure both nationally and in Newfoundland and Labrador, especially since 1980. In 2007, the stock of wastewater treatment facilities had reached 62% of their estimated life, almost equal to the national average.

Sewer systems: Ageing and older than national average

Average age of sanitary and storm sewers in Newfoundland and Labrador has been steadily increasing since 1983. The rate of increase has also been accelerating in the last decade due to low rates of investments in this asset. The average age went from 14.7 years in 1983 to 20.9 years in 2007, the oldest among all provinces.

As a percentage of estimated useful life, storm sewer infrastructure in Newfoundland and Labrador has been ageing faster than the national average since 1996 when both rates were the same. In 2007, the provincial rate has reached 62%, 9 percentage points above the national figure.

Prince Edward Island: Second youngest public infrastructure, but on an ageing trend

The value of public infrastructure assets in Prince Edward Island amounted to $1.6 billion in 2007. Overall, public infrastructure in Prince Edward Island has been ageing since the opening of the Confederation Bridge in 1997. Historically, the age of public assets in the province was over the national average until 1991. The construction of the Confederation Bridge reversed this profile and brought the provincial average under the national figure since then.

Overall, Prince Edward Island public infrastructure stood the second youngest among the provinces in 2007. While roads and bridges in the province are newer on average compared with other provinces, wastewater treatment facilities and sewer systems are much older than the Canadian average.

Highways and roads: Youngest network in Canada with Ontario

Highways and roads in Prince Edward Island accounted for half of the total public infrastructure stock in the province in 2007. This ratio was the lowest in the country — the national average was 59% — and can be explained by the unusually large weight of the Confederation Bridge in the total asset pie.

The provincial road network in Prince Edward Island has benefited from sustained investments from the mid-1980s until the early 2000s. The average age of this asset thus lessened from a high of 19.5 in 1984 to a low of 12.5 years in 2002. However, average age has since increased to 13.9 years in 2007.

Roads in Prince Edward Island reached 49% of their estimated useful life in 2007, compared with 53% for roads nationally. As a result, this province, along with Ontario, had the youngest road network among provinces.

Bridges and overpasses: Youngest in the country but ageing

The average age of bridges and overpasses in Prince Edward Island has historically always been younger than the national average since 1961. Between 1993 and 1996, the average age dropped from 21.6 to 6.5 years due to the construction of the Confederation Bridge. Average age has since reverted back closer to its historical range, and by 2007 had reached 15.6 years.

As with average age, the ratio of estimated useful life is also skewed by the construction of the Confederation Bridge. Estimated life use dropped from 50% in 1993 to 15% in 1996 and has since climbed back to 36% in 2007. This is still far below the national average of 57%, making Prince Edward Island the province with the smallest age-to-useful life ratio in Canada.

Water supply systems: Getting younger but still fourth oldest

Average age of water supply systems was reduced from 21.8 in 1994 to a low of 14.8 years in 2007, in the wake of strong investment over the years. As a percentage of estimated useful life, the provincial rate has historically been substantially higher than the national average until recent years.

In 2007, the provincial ratio was 40%, equal to the Canadian average. Water supply systems accounted for 4% of Prince Edward Island infrastructure, the smallest proportion among provinces.

Wastewater treatment: Getting younger since 2005, but still oldest in the country

Wastewater treatment assets in Prince Edward Island have had a long-term trend toward ageing. This trend has stopped lately, but has raised the average age from 14.8 years in the early 1980s to 22.8 years in 2007. The recent reduction in age is mainly attributable to the discarding of older investments. As a result, this asset accounted for 8% of total infrastructure stock in the province, down from 11% in 2001.

The wastewater treatment asset in Prince Edward Island has passed 81% of its useful life compared to 63% on average at the national level. This is the highest percentage recorded for this asset in any province.

Sewer systems: Third oldest in the country as investments lag

The average age of the province's sewer systems has reached its record low of 16.0 years in 1988. Since then, it increased almost steadily to reach 20.0 years in 2007.

In terms of useful life, the rate stood at 60% in 2007, 7 percentage points above the national average, making Prince Edward Island the province with the third oldest asset in this category.

Nova Scotia: Oldest public infrastructure in Canada

The value of public infrastructure assets in Nova Scotia amounted to $8.1 billion in 2007. Overall, Nova Scotia had the oldest public infrastructure in Canada in 2007. The average age of all five assets combined has been generally increasing from 14.2 years in 1973 to a high of 19.2 years in 2003. Recent investments in the highways and roads and wastewater treatment systems have reversed the trend and brought the overall average age to 18.0 years in 2007. However, this is still 1.7 years above the overall Canadian average.

Highways and roads: Higher investments reducing average age

The average age of Nova Scotia's highways and roads dropped noticeably from 18.5 years in 2001 to 16.3 years in 2007. This reduction in age was attributable to the discarding of older investments as total gross stock decreased 0.8% per year on average during the period.

As a result, this asset accounted for 62% of the total public infrastructure in Nova Scotia in 2007, down from 64% in 2001. In 2007, the average age of Nova Scotia's roads reached 58% of their estimated useful life, compared with 53% for all Canadian roads. As a result, this province had the fourth oldest road network among provinces, behind Manitoba, Saskatchewan and Newfoundland and Labrador.

Bridges and overpasses: Second oldest after Quebec and getting older

Bridges and overpasses average age increased every year but one since 1982 in Nova Scotia. Although the average age of this asset has been increasing both nationally and provincially, the increase has been substantially larger in Nova Scotia in recent years due to low investment rates. It grew from 19.5 years in 1990 to 24.2 in 2001. Afterwards, the ageing process accelerated, causing the average age of bridges and overpasses to climb to 28.6 years in 2007, second oldest after Quebec.

Bridges and overpasses were the third most important public asset in Nova Scotia, accounting for 10% of its public infrastructure stock. As a percentage of estimated useful life, the rates in both the province and nationally were about the same at the turn of the millennium. By 2007, Nova Scotia's figure rose to 66% compared to 57% nationally.

Water supply systems: Renewed investments lowering age since 2004

The average age of water supply systems in Nova Scotia peaked at 19.3 years in 2004 and has dropped rapidly since then to 17.0 years in 2007. This reduction was attributable to large investments in recent years.

As a result, the share accounted for by this asset in the public infrastructure stock of the province increased from 7% in 2001 to 8% in 2007. While age has traditionally been higher than the national average for this asset, the gap has narrowed in recent years. In 2007, the provincial useful life expended for this asset was 46% compared to 40% nationally, the third highest gap after Newfoundland and Labrador and Quebec.

Wastewater treatment: One of the youngest three in the country

The average age of the wastewater treatment stock has followed a similar trend as for the water supply systems. It peaked at 19.7 years in 2003 and then dropped by 2.9 years to an average of 16.8 years in 2007, following recent large investments. Wastewater treatment facilities thus accounted for a slightly larger share of public infrastructure stock in the province standing, 8% in 2007.

There has been a trend toward ageing of the wastewater treatment infrastructure since 1985, both nationally and in Nova Scotia. However, as a percentage of estimated useful life, the provincial rate has fallen from 70% in 2003 to 60% in 2007, which was less than the national average of 63%. Nova Scotia ranked first followed closely by Ontario and British Columbia in terms of youngest wastewater treatment assets.

Sewer systems: steady ageing trend since 1981

The average age of this asset was higher in 2006 than at any time since 1967. The lowest average age was in 1981 at 14.3 years. Low investment rates in this asset have resulted in a steady ageing trend, reaching an average 19.7 years in 2007. Sewer systems are the second most important public asset in Nova Scotia. In 2007, they accounted for 12% of the total investment in public infrastructure.

Although there has been a long-term trend towards ageing of sanitary and storm sewers since 1980, both nationally and provincially, this trend has been more pronounced in Nova Scotia in recent years. By 2007, sanitary and storm sewers had reached 59% of their estimated useful life, well above the national average of 53%. This put the province in the fourth place in terms of oldest sewer systems among provinces.

New Brunswick:
Age of most public infrastructure assets above national average

The value of public infrastructure assets in New Brunswick amounted to $10.2 billion in 2007. Overall, the average age of the public infrastructure in New Brunswick has been fairly stable since 1996. New Brunswick's public infrastructure aged from 14.7 years in the mid-1970s to its all time high of 17.5 years in 1993. Thereafter, the average age was reduced to 16.8 years in 1996 and it fluctuated around this age until 2007.

In 2007, the age of most public infrastructure assets in the province were slightly above the national average, except for bridges and overpasses, which were the third youngest among the provinces. Overall, the average age of all public infrastructure assets combined was above the national average and ranked fifth in terms of the youngest infrastructure stock.

Highways and roads: Recent investments reduced average age

The average age of highways and roads reached a peak of 17.2 years in 1993, but has since dropped to 15.2 years on the strength of new investments. In New Brunswick, highways and roads accounted for 62% of total public infrastructure stock in 2007.

As a percentage of estimated useful life, provincial age has closely reflected the national average over the decades. In 2007, roads in New Brunswick had passed 54% of their estimated useful life, compared with a national average of 53%.

Bridges and overpasses: Ageing but younger than those in other provinces

In New Brunswick, bridges and overpasses have been ageing since 1999 reaching an average of 21.2 years in 2007. However, this was still well below the national average of 24.5 years, placing New Brunswick in the third position after Prince Edward Island and Newfoundland and Labrador in terms of youngest asset of this category. The construction of the Confederation Bridge partly explains this relatively high ranking of New Brunswick since the investments in the bridge have been allocated equally to the two linked provinces.

In this province, the value of the gross stock invested in bridges and overpasses accounted for 19% of total public assets, compared with 8% at the national level. This relatively high share—second largest after Prince Edward Island—was due to the allocation of the investment in the construction of the confederation bridge to these two provinces. As a percentage of the estimated useful life, the province has been below the national average since 1967. In 2007, the provincial usage rate was 49%, 8 percentage points below the national average of 57%.

Water supply systems: Getting younger but older than in other provinces

Average age of water supply systems in the province reached its oldest peak of 19.9 years in 1995. Since then, the average age of this asset has been reduced through increased rates of investments, dropping to 16.7 years in 2007.

As a percentage of the estimated useful life, the provincial rate has been above the national average for most years since 1961. The rate was 45% in 2007, 5 percentage points over the national average.

Wastewater treatment: Rejuvenation after peaking in 2003

Wastewater treatment assets in New Brunswick followed a steady ageing trend from 1978 to 2003 when they reached their peak at 19.0 years. Recent investments have reversed the trend downward to 18.4 years in 2007. As a percentage of estimated useful life, the province has followed the growing national average in most years since 1980. The rate for the province stood at 65% in 2007, compared to 63% at the national level.

Sewer systems: Relatively newer than during the 1960s

The average age of sewers has increased steadily since 1987, when it was 13.4 years. In 2007, the age has reached 18.4 years. However, sewers are relatively much newer now in the province than they were in the 1960s. As a percentage of estimated useful life, the gap with the national average, which was around a disadvantaging 20 percentage points for the province in the 1960s, has been reduced considerably by 2007. The 2007 rates were 55% in the province compared to 53% nationally.

Quebec:
Fourth oldest public infrastructure among provinces

In Quebec, the value of total public infrastructure stock amounted to $68.1 billion or 24% of the national total in 2007. The average age for the five public infrastructure assets has been lessening from its plateau value of 18.6 years at the turn of the millennium to 17.2 years in 2007. This recent reduction, fuelled largely by strong investments in roads, followed a period of steady ageing which started in 1974.

However, the average age of Quebec public infrastructure stock was still above the Canadian average in 2007. It ranked fourth, along with Newfoundland and Labrador, in terms of oldest public infrastructure after Nova Scotia, Manitoba and Saskatchewan. This above average ranking was attributable in parts to bridges and water supply systems which were among the oldest in the country. Quebec was the only province where the average age of each of the five assets was consistently above the national average.

Highways and roads: Benefiting from renewal investments

Since 2001, investments in roads in Quebec have been higher than at any time since the mid-1970s. This infrastructure accounted for 62% of the total public asset stock in 2007, making it the largest public infrastructure investment in the province. Strong investments and the discarding of older investments since 2001 have resulted in a significant lowering of the average age, from a peak of 18.6 in the 1990s to 15.2 years in 2007.

While above the national average, Quebec ranked fourth with New Brunswick in terms of youngest road network. As a percentage of estimated useful life, Quebec rate was at 66% in the 1990s, compared to 60% nationally. The gap has narrowed to only one percentage point by 2007 with rates of 54% in Quebec and 53% nationally.

Bridges and overpasses: Oldest among provinces

Bridges and overpasses have not benefited from a reversal of their ageing trend since the early 2000s as was the case for roads. From a low of 18.1 years in 1969, there has been a steady trend of increasing age in almost every year since then, originating mostly from low investments. In 2007, bridges reached the age of 31.0 years, the oldest among all provinces. From 2001 to 2007, the

gross capital stock for bridges in Quebec declined 1.3% per year on average compared to an increase of 0.4% nationally. The only other provinces to record negative growth rates during this period were Nova Scotia and Prince Edward Island.

As a result, this asset type accounted for only 6% of the public infrastructure assets in the province, the lowest rate among all provinces. As a percentage of estimated useful life, Quebec matched the national average in 1983 at 49%. However, by 2007, the Quebec rate was 72% compared with 57% nationally, a gap of 15 percentage points.

Water supply systems: Ageing trend since the early 1990s

Water supply systems in Quebec were on a rejuvenating trend in the 1980s when they reached their all-time low age of 12.2 years in 1986. Shortly thereafter, a long-term steady trend to more moderate investments in this type of assets has caused the average age of water supply systems to climb to 18.5 years in 2007, the oldest in the country.

From 2001 to 2007, the average annual rate of increase in this asset's gross stock was 2.0% compared to 5.1% nationally, the lowest among all provinces. It represented 12% of all public assets in the province in 2007, the second most important investment. As a percentage of estimated useful life, Quebec rate was in line with the national average back in 1999 at 46%. In 2007, the Quebec rate was 50% compared to 40% nationally, a gap of 10 percentage points.

Wastewater treatment: Steady ageing since 1990

Quebec wastewater treatment assets stood at a more or less a steady average age from 1961 until 1990, averaging 13.8 years. However, the relatively low investments in most years thereafter caused the age to increase steadily to an average of 19.1 years in 2007.

As a percentage of estimated useful life, Quebec was much below the national average in 1991 at 48% compared to 54% nationally. This situation has now reversed. In 2007, wastewater treatment plants in Quebec had passed 68% of their estimated useful life, compared with a national average of 63%.

Sewer systems: Following national ageing trend

Sanitary and storm sewers were also on a steady ageing trend in Quebec since the early 1980s. The age grew from an average of 13.7 in 1980 to 18.1 in 2007, slightly above the national average of 17.9 years. As a percentage of estimated useful life, Quebec tracked closely to the national average which has been growing also in most years. In 2007, the provincial rate was 54%, slightly above the national rate of 53%.

Ontario:
Youngest public infrastructure in the country

Ontario's public infrastructure stock amounted to $93.3 billion, or 33% of the country's total. In 2007, the province had the youngest public infrastructure in the country, averaging 15.4 years. The province was followed closely by Prince Edward Island and Alberta which also recorded average ages below 16.0 years.

In Ontario, there has been a clear renewal of the five public infrastructure assets since the early 1990s. On average, the age of its overall pubic assets was 15.4 in 2007, down from 17.4 years in

1994. This reduction was driven mainly by large investments in roads as well as in the water supply systems.

Highways and roads: Sustained investments lowering average age

Highways and roads, the most important asset, accounted for 57% of total public infrastructure stock in Ontario in 2007. Many years of strong investments after 1994 have lowered the average age of the province's road network from 16.8 to 13.9 years. This is approaching the historic low of 13.3 years last seen in 1973.

In 2007, Ontario drivers, along with those of Prince Edward Island, enjoyed the youngest road network in the nation. As a percentage of estimated useful life, Ontario rate has tended to track very closely with the national average in most years. However, a somewhat larger gap has opened up in favour of Ontario in recent years. In 2007, roads in Ontario had passed only 49% of their estimated useful life, compared with a national average of 53%.

Bridges and overpasses: Benefiting from large investments in recent years

The average age of bridges and overpasses in Ontario has evolved irregularly since the early 1960s, reaching an all-time low of 21.8 years in 1993. Thereafter, more moderate investments raised the average to a record high of 24.5 years in 2004. The trend has reversed since and large investments in recent years brought the 2007 average to 24.1 years.

Yet, Ontario ranked third among provinces in terms of having oldest bridge infrastructure in 2007, after Quebec and Nova Scotia. Bridges and overpasses in Ontario accounted for 7% its public infrastructure stock in 2007. As a percentage of estimated useful life, Ontario rate was very close to the national average in most years. In 2007, the rates were 56% in Ontario compared to 57% nationally.

Water supply systems: Strong investments reduce average age to 1960s levels

Ontario's water supply systems peaked at an average age of 21.2 years in 1987. New investments have brought down the age of this asset to 13.1 years in 2007, the lowest level since the 1960s. The rejuvenating trend was most pronounced from 2001 to 2007 when gross stock grew 7.1% a year on average, compared with about 5.1% at the national level. Only British Columbia recorded a faster stock growth rate (+8.1%). As a result, the share of this asset in Ontario's total public infrastructure stock increased from 9% in 2001 to 12% in 2007, the third most important investment after roads and highways and sewer systems.

As a percentage of estimated useful life, Ontario rate was above the national average through the 1980s and 1990s. This has changed in recent years. In 2007, water supply systems in Ontario had passed only 36% of their estimated useful life, compared with a national average of 40%.

Wastewater treatment: Recent investments stop ageing trend

In the mid-1970s, the average age of wastewater treatment assets were at their all-time low of 13.4 years. Through several years of relatively low investments, the age climbed almost steadily to 17.4 years in 2004 before dropping to 16.9 years in 2007, on the strength of renewed investments.

As a percentage of estimated useful life, Ontario tended to run close to the national average in most years, as for the other assets. In 2007, the provincial rate was 60%, compared to 63% nationally.

Sewer systems: Relatively older than other infrastructures

Sanitary and storm sewers in Ontario reached their lowest average age during the 1970s at 14.2 years. Since then, their age has risen slowly, reaching a high of 18.4 in 2002, and then dropping marginally to 18.3 years in 2007. The slow ageing of this infrastructure can be linked to a combination of moderate investment rates over the years and low discard rates from the gross investment stock.

As a percentage of estimated useful life, Ontario has been slightly above the national average since the early 1980s. In 2007, the provincial rate was 54% compared to 53% nationally.

Manitoba:
Second oldest public infrastructure among provinces

The value of public infrastructure assets in Manitoba amounted to $10.2 billion in 2007. Overall, Manitoba had the second oldest public infrastructure in the country in 2007, exceeded only by Nova Scotia. This was mainly attributable to the fact that these two provinces, along with Saskatchewan and Newfoundland and Labrador, are among those having the oldest stock of highways and roads in the country.

However, the average age of the five assets taken altogether was reduced substantially since the recent high of 18.7 in 2001. This recent reduction in age was driven by renewed investments in roads and highways and the discarding of older investments which lowered the average age to 17.7 years in 2007.

Highways and roads: Oldest network despite recent reduction in average age

Highways and roads, the most important asset in the province, accounted for 52% of total public infrastructure stock in Manitoba in 2007. The average age of the road network in the province peaked at 18.2 years in the late 1990s, following a long-term ageing trend that started in 1970. Between 2001 and 2007, the average age was reduced from 18.1 years to 17.1 years in the wake of years of larger investments and the discarding of older investments.

However, the province still had the oldest road network in 2007. Expressed as a percentage of useful life, roads in Manitoba have tended to be over the national rate. In 2007, roads in Manitoba had passed 61% of their estimated useful life, compared with a national average of 53%. This was the largest gap for this type of asset among all provinces.

Bridges and overpasses: Fourth youngest infrastructure in the country

Bridges in Manitoba are in better condition than roads compared with the national average. In fact, the average age of bridges in the province has followed a general downward trend from 1961 to the late 1990s. It then increased slightly to 23.2 years in 2005 and dropped to 22.4 years in 2007. This is far lower than in the 1960s, when age was in the 29-year range.

This placed the province under the national average and ranked it fourth among provinces in terms of the youngest infrastructure of this type. Bridges and overpasses in Manitoba tied with water supply systems as the second most important public infrastructure investment in the province, each accounting for 13% in 2007.

As a percentage of estimated useful life, the rate for this asset dropped below the national average in 1994. In 2007, bridges and overpasses in Manitoba had passed 52% of their estimated useful life, compared with a national average of 57%.

Water supply systems: Rejuvenating trend since 1985

The average age of this asset has been in steady reduction since 1985, when it was 21.2 years. By 2007, the age had dropped to an average of only 15.3 years, following many years of strong investment. This was the youngest age since 1963.

As a percentage of estimated useful life, Manitoba has tended to be above the national average over many decades. However, the gap narrowed by 2007 as the rate for the province stood at 42% compared to 40% nationally.

Wastewater treatment: Older infrastructure compared to other provinces

Wastewater treatment assets in Manitoba have been traditionally older than that of other provinces. The average age went through peaks and troughs since the seventies from a low of 14.0 years in 1970 to a high of 18.9 years in 2004 in response to investment swings. The age averaged 18.5 years in 2007, down slightly from the 2004 peak. As a percentage of estimated useful life, Manitoba has tended to be above the national average in most years. In 2007, the ratio was 66% provincially compared with 63% nationally.

Sewer systems: Steady age reduction since 1993

Following sustained investments since 1993, the average age of sanitary and storm sewers in Manitoba has dropped from 20.0 years in 1993 to 17.3 years in 2007. As a percentage of estimated useful life, Manitoba has been below the national average since 2005. In 2007, sanitary and storm sewers had passed 51% of their estimated life, compared with 53% nationally.

Saskatchewan: Major reduction in age of most infrastructures, except for sewers

The value of public infrastructure in Saskatchewan amounted to $9.0 billion in 2007. Saskatchewan had the third oldest infrastructure in the country in 2007, exceeded only by Nova Scotia and Manitoba. This was mainly attributable to the fact that these three provinces, along with Newfoundland and Labrador, are among those having the oldest stock of highways and roads in the country.

However, Saskatchewan has seen major reduction in average age in most of its public assets since the beginning of the millennium. The average age of all assets combined was reduced from a peak age of 19.4 years at the beginning of the millennium to 17.6 years in 2007. Like Manitoba, the recent reduction was driven mainly by new investments and the discarding of older investments in the road asset.

Highways and roads: Among the oldest in the country

Highways and roads, the most important asset in the province, accounted for 58% of total public infrastructure stock in 2007. Roads were on a steady ageing trend in the province from the early 1970s to the late 1990s. Thereafter, increased investments and the discarding of some older investments from the gross stock base caused the average age of roads to drop by almost two full years from 18.6 years in 2000 to 16.7 years in 2007.

As a percentage of estimated useful life, Saskatchewan has been above the national average since 1993. It had been below the national average for most of the preceding 25 years. In 2007, highways and roads in the province had passed 59% of their estimated life, compared to the national average of 53%, the second largest gap among all provinces.

Bridges and overpasses: Rejuvenation fuelled by high investments

Bridges and overpasses, which accounted for 9% of all public assets in Saskatchewan in 2007, were younger relative to the national average. The average age of this asset has followed a general downward trend from 1961 to the late 1980s. It then increased slowly to a high of 26.0 years in 2003 and then started lessening sharply to 23.3 years in 2007, a value which stands in the historic low range for this province. This recent lessening in age was fuelled by strong investments. The gross value of this asset grew 2.1% on average each year from 2001 to 2007, the highest average annual growth, along with Newfoundland and Labrador, among the provinces.

As a percentage of estimated useful life, this investment was newer than the national average in 2007. Bridges and overpasses in the province had passed 54% of their estimated life, compared to the national average of 57%. This is an historic turnaround because bridges in Saskatchewan had never been younger than the national average until 2006.

Water supply systems: Average age at historic low in 2007

Water supply systems in Saskatchewan have generally benefited from sustained investments since 1982, when the average age was 21.6 years. In addition, the rate of investments in these assets accelerated after 2000, following the national average rate of 5.1% per year.

As a result, the average age of water supply systems in Saskatchewan reached an historic low of 15.1 years in 2007. Water supply systems were the second most important public infrastructure in the province in 2007, accounting for 13% of the total stock.

As a percentage of estimated useful life, Saskatchewan has historically been above the national average, but the gap has narrowed substantially by 2007. The rate was 41% for the province compared to 40% nationally.

Wastewater treatment: Younger than national average for the first time in 38 years

The average age of wastewater treatment facilities has been on an ageing trend since the early 1980s. This trend culminated in 2003 at 19.7 years. Larger investments since then brought the average down to 17.6 years in 2007. As a percentage of estimated useful life, the provincial rate in 2007 was below the national average for the first time since 1969, at 62% compared to 63%.

Sewer systems: More or less steady ageing trend

Contrary to other assets, sanitary and storm sewers in Saskatchewan have been on a more or less steady and long-term ageing trend since the 1960s. Even though it fell slightly to 20.4 years in 2007, the average age of sewers in Saskatchewan was still among the three oldest among the provinces.

As a percentage of estimated useful life, Saskatchewan has consistently shown higher rates than the national average since the early 1970s. By 2007, sewer systems in the province had passed 61% of their estimated life, compared to the national average of 53%.

Alberta:
Third youngest public infrastructure in the country

The value of Alberta's total public infrastructure increased at an average annual rate of 2.1% between 2001 and 2007, the fastest among the provinces. This brought the total value to $35.2 billion or 12% of the national total in 2007.

In 2007, Alberta had the third youngest public infrastructure in the country after Ontario and Prince Edward Island. It was however the only province where the average age of each of the five assets was consistently under the national average. Alberta's public infrastructure showed definite ageing in the 1990s, rising from an average all-time low age of 14.5 years in 1989 to 16.7 years in 1999. Since then, it has dropped sharply to 15.6 years in 2007. This drop was driven by large investments since the beginning of the 2000s.

Highways and roads: Sharp investment increases since early 2000s

Highways and roads were the largest component of public infrastructure assets in Alberta, accounting for 62% of the total. The average age of roads in the province reached an all time peak of 15.5 years by the turn of the millennium but has since dropped to 14.4 years in 2007. This reflects the impact of higher investments.

In terms of percentage of estimated useful life, Alberta roads have tended to be considerably under the national average since 1982, but the gap in favour of the province has narrowed in recent years. In 2007, the rates were 51% of useful life expended in Alberta compared to 53% nationally.

Bridges and overpasses: Ageing trend slowed in 2007

Bridges and overpasses in Alberta, which accounted for 9% of total public infrastructure stock in 2007, were young relative to the Canadian average. However, the average age of this asset has been on a steady increase since 1989 when it stood at 18.9 years. Investments in this asset from 1990 to 2006 had not been large enough to stop the ageing trend. As a result, the average age of bridges in the province increased to 23.0 years by 2006 and stayed at the same age in 2007.

As a percentage of estimated useful life, investment in this infrastructure in Alberta was consistently greater than the national average up to 1980. Thereafter, it was consistently below the national average. By 2007, bridges and overpasses in Alberta had reached 53% of their estimated life, compared with 57% nationally.

Water supply systems: Younger than ever

The average age of the water supply systems in Alberta has fluctuated over the past 25 years. Changes have reflected investment swings, especially large investments since the last ten years. This lowered the average age from 17.8 years in 1996 to 14.0 in 2007. Water supply systems were the third most important public asset in Alberta in 2007, accounting for 10% of the total stock.

As a percentage of estimated useful life, Alberta has tended to track closely to the national average, varying only by a few percentage points either above or under. In 2007, water supply systems in Alberta had reached 38% of their estimated life, compared with 40% nationally.

Wastewater treatment: Ageing trend reversed in 2005

The average age of Alberta's wastewater treatment facilities rose steadily from 12.1 years in 1983 to 19.8 years in 2004. Investments were low during these years, but have since been much more robust and sufficient to lower the average age to 17.7 years in 2007.

As a percentage of estimated useful life, Alberta peaked in 2004 at 70% but has since dropped considerably to 63% in 2007, the same as the national rate.

Sewer systems: Renewed investments since 2003

The average age of sanitary and storm sewers in Alberta has fluctuated over the past 25 years in line with investment swings, from an all time low of 14.6 years in 1984 to an all time high of 17.8 years in 1997. The most recent trend has been toward larger investments since 2003, which lowered the average age to 16.3 years in 2007.

As a percentage of estimated useful life, Alberta has tended to follow closely the national average in most years since 1990. However, the gap has widened in recent years in favour of the province. In 2007, sewer systems had reached 49% of their estimated useful life, compared with 53% nationally.

British Columbia: Except roads, most infrastructure were newer compared to national level

The value of public infrastructure in British Columbia amounted to $40.9 billion in 2007, representing 14% of the national total. Overall, the average age of the public infrastructure in British Columbia increased from a low of 14.7 years in 1973 to a high of 16.7 years in 2002. However, the discarding of large older investments and inflows of new stock into the water supply systems since then has reversed the trend and lowered the age to an average of 16.3 years in 2007, matching the national average.

Highways and roads: Below-average investment levels

Highways and roads were the most important public asset in British Columbia, accounting for 59% of total public infrastructure stock. The average age of this asset displayed a steady ageing trend from 12.2 years in 1968 to 16.5 years in 2003. The trend has reversed timidly in 2004 as a result of increased investment and the discarding of older investments. However, the average age was still above the national average in 2007, standing at 15.8 years. This is the only asset type in British Columbia with an average age above the national average.

As a percentage of the estimated useful life, British Columbia was consistently below the national average until 2002 when the trend reversed. In 2007, roads and highways in British Columbia had reached 56% of their estimated useful life, compared with 53% nationally.

Bridges and overpasses: Age consistently under national average

Average age of bridges and overpasses in British Columbia, which accounted for 9% of total public infrastructure stock in 2007, did not show much change since the mid-1980s when it hit an historic low of 21.3 years for the first time. The trend has been fairly flat since then, as the age fluctuated between 21.3 and 23.1 years. Investments in recent years in this asset were at a level just sufficient to maintain the average age of bridges in British Columbia under the national average.

As a percentage of estimated useful life, British Columbia matched the national average in the early 1990s, but has since been under it. In 2007, bridges and overpasses in British Columbia had reached 53% of their estimated useful life, compared with 57% nationally.

Water supply systems: Youngest public infrastructure in the country

Water supply systems in British Columbia were the youngest in the country in 2007. The average age of this asset has dropped steadily since 1981 in response to large investments, especially in recent years. The average age in 1981 hit its highest point ever at 20.1 years. It then dropped steadily to reach 11.4 years in 2007, the youngest age of any type of public asset in any province. Water supply systems accounted for 11% of all public asset stock in the province.

As a percentage of estimated useful life, the provincial rate has dropped considerably since 1990. In that year, both the provincial and national numbers stood at 44%. By 2007, water supply systems in British Columbia had reached only 31% of their estimated useful life, while the national rate had dropped to 40%, opening a gap of 11 percentage points.

Wastewater treatment: Steady ageing trend since 1998

The average age of wastewater treatment facilities in British Columbia has risen from 13.4 years in 1998 to 17.2 years in 2007. This trend, which was still continuing, coincided with years of lower investments in recent years following several years of major inflows in the mid-1990s.

As a percentage of estimated useful life, British Columbia has trended below the national average since 1981. But both have increased considerably in the last 25 years. The British Columbia figure was 61% in 2007 compared with 63% nationally.

Sewer systems: Slower investments in recent years

The average age of sanitary and storm sewers reached its all-time high of 17.6 years in 1997. Several years of stronger investments thereafter lowered the average age to 16.4 years in 2002. Since then, slower investments have caused an increase in age to 16.9 years in 2007.

The provincial rate for estimated useful life has fluctuated closely with national rates over many years. By 2007, sewer systems in British Columbia had reached 50% of their estimated useful life, compared with 53% nationally.

Definitions and data sources

Capital stock

Capital stocks are reproducible tangible assets that are used as factors of economic production in combination with other factor inputs such as labour, energy and other natural resources or materials. The stock of capital consists of building construction (such as plants and offices), engineering construction (such as dams) and machinery and equipment used in the production process. They are distinguished from non-reproducible assets such as land, mineral deposits and natural resources, which are not produced but are directly incorporated in the production of other commodities.

Investment

Investment data measure the additions to capital stock during a particular period. The investment data are provided by the Capital and Repair Expenditures Survey, which collects a wealth of detail on capital expenditures. Respondents are asked to report their expenditures on over 50 types of machinery and equipment assets and over 90 types of construction assets.

Gross/net capital stock

The gross capital stock is the cumulated total of all investments made on a specific asset. Every single investment has an estimated useful life and depreciation rate which are taken into account to (1) discard the investment when it is no longer considered useful and to (2) compute the value of the stock at the end of a given period, net of depreciation to arrive at an estimate of the net capital stock.

Data sources

Infrastructure statistics are derived primarily from Investment and Capital Stock Division's Capital and Repair Expenditures Survey. The average age of capital stock is compiled by the National Wealth and Capital Stock Section of the Investment and Capital Stock Division. For more information on data sources, methodology and derived variables, please see *Private and Public Investment in Canada, Revised Intentions*, Statistics Canada Catalogue no. 61-206-XIB2003000.

Table 1
Average age of public infrastructure by province and type of infrastructure, 2007

	Highways and roads	Bridges and overpasses	Water supply systems	Wastewater treatment	Sewer systems	Total
	years					
Canada	14.9	24.5	14.8	17.8	17.9	16.3
Newfoundland and Labrador	16.4	20.9	14.3	17.6	20.9	17.2
Prince Edward Island	13.9	15.6	14.8	22.8	20.0	15.5
Nova Scotia	16.3	28.6	17.0	16.8	19.7	18.0
New Brunswick	15.2	21.2	16.7	18.4	18.4	16.9
Quebec	15.2	31.0	18.5	19.1	18.1	17.2
Ontario	13.9	24.1	13.1	16.9	18.3	15.4
Manitoba	17.1	22.4	15.3	18.5	17.3	17.7
Saskatchewan	16.7	23.3	15.1	17.6	20.5	17.6
Alberta	14.4	23.0	14.0	17.7	16.3	15.6
British Columbia	15.8	23.0	11.4	17.2	16.9	16.3

Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.

Table 2
Value of public infrastructure's gross capital stock by province and type of infrastructure, 2007

	Highways and roads	Bridges and overpasses	Water supply systems	Wastewater treatment	Sewer systems	Total
	millions of dollars					
Canada	170,071	23,926	32,252	23,955	35,957	286,161
Newfoundland and Labrador	3,518	708	728	594	462	6,010
Prince Edward Island	796	509	56	128	89	1,578
Nova Scotia	5,059	789	680	679	941	8,148
New Brunswick	6,298	1,906	594	697	675	10,170
Quebec	42,083	4,288	8,432	5,500	7,800	68,103
Ontario	53,504	6,632	11,287	8,503	13,341	93,267
Manitoba	5,357	1,322	1,332	997	1,203	10,211
Saskatchewan	5,248	820	1,133	883	952	9,036
Alberta	21,717	2,976	3,434	2,564	4,495	35,186
British Columbia	24,146	3,762	4,290	3,076	5,660	40,934

Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.

Table 3
Average age of public infrastructure as a percent of useful life by province and type of infrastructure, 2007

	Highways and roads	Bridges and overpasses	Water supply systems	Wastewater treatment	Sewer systems
	percent				
Canada	53	57	40	63	53
Newfoundland and Labrador	58	48	39	62	62
Prince Edward Island	49	36	40	81	60
Nova Scotia	58	66	46	60	59
New Brunswick	54	49	45	65	55
Quebec	54	72	50	68	54
Ontario	49	56	36	60	54
Manitoba	61	52	42	66	51
Saskatchewan	59	54	41	62	61
Alberta	51	53	38	63	49
British Columbia	56	53	31	61	50

Source: Statistics Canada, special tabulation, Investment and Capital Stock Division.